

REMARKS

The present Amendment amends claims 1, 7, 13 and 19, and leaves claims 2-6, 8-12, and 14-18 and 20-24 unchanged. Therefore, the present application has pending claims 1-24.

The disclosure stands objected to due to informalities noted by the Examiner in paragraph 2 of the Office Action. Amendments were made to the specification to correct the informalities noted by the Examiner. Therefore, this objection is overcome and should be withdrawn. Accordingly, reconsideration and withdrawal of this objection is respectfully requested.

Claim 1 stands rejected under the judicially created doctrine of obviousness type double patenting as being unpatentable over claims 1, 7, 13 and 19 of prior patent No. 6,757,782; claims 1-12 stand rejected under the judicially created doctrine of obviousness type double patenting as being unpatentable over claims 1-24 of prior patent No. 6,615,314 and claims 1-24 stand provisionally rejected under the judicially created doctrine of obviousness type double patenting as being unpatentable over claims 1-24 of copending Application No. 10/759,248. Applicants do not agree with these rejections. However, in order to expedite prosecution of the present application filed on even date herewith are Terminal Disclaimers obviating these rejections. Therefore, reconsideration and withdrawal of these rejections is respectfully requested

It should be noted that the filing of the Terminal Disclaimers was not intended nor should it be considered as an agreement on Applicants' part that the features recited in the claims are taught or suggested by the claims of the prior patents and co-pending application. The filing of the Terminal

Disclaimers was simply intended to expedite prosecution of the present application.

Claims 13, 14, 18-20 and 24 stand rejected under 35 USC §103(a) as being unpatentable over Anderson (U.S. Patent No. 5,617,425) in view of Johnson (U.S. Patent No. 5,862,313); Claims 1, 2, 6-8 and 12 stand rejected under 35 USC §103(a) as being unpatentable over Anderson in view of Matoba (U.S. Patent No. 5,611,069) and Johnson; Claims 15-17 and 21-23 stand rejected under 35 USC §103(a) as being unpatentable over Anderson in view of Johnson and Brown (U.S. Patent No. 6,148,414); and claims 3-5 and 9-11 stand rejected under 35 USC §103(a) as being unpatentable over Anderson in view of Matoba, Johnson and Brown. These rejections are traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 1-24 are not taught or suggested by Anderson, Matoba, Johnson and Brown whether taken individually or in combination with each other as suggested by the Examiner. Therefore, reconsideration and withdrawal of these rejections is respectfully requested.

The features of the present invention as now more clearly recited in the claims are not taught or suggested by any of the references of record, particularly Anderson, Matoba, Johnson and Brown, whether taken individually or in combination with each other.

The present invention as now recited in the claims is directed to a disk array which includes a plurality of disk units, at least one spare disk unit serving as a spare for said disk units, a first control unit, to be connected to a host unit, for controlling input and output between said host unit and said disk

array, a second control unit, connected to the spare disk and said disk units, for controlling input and output between said first control unit and said disk units and controlling transfers between said disk units, a common memory which stores disk management data indicating a status of each of said disk units, and a plurality of multiplex communication channels each connecting some of the disk units, the spare disk and the second control unit.

According to the invention data transfer in each of said multiplex communication channels is controlled by the second control unit, and data transfer speed of the multiplex communication channel is higher than that of each of the disk units. The disk units form a plurality of groups each including at least one disk unit from each communication channel. The data of a disk unit connected to one communication channel of a group can be recovered using data of another disk unit connected to another communication channel of the group.

The above described features of the present invention are disclosed in the specification and drawings. For example, the features of the present invention as now recited in each of the independent claims 1, 7, 13 and 19 are described in the specification on page 4, lines 8-21, page 18, lines 6-15 and page 26, lines 6-10 and is illustrated in Fig. 2 elements 20, 21 and 25 and Fig. 10 elements 10-4 and 10-5.

The above described features of the present invention now more clearly recited in claims 1-24 are not taught or suggested by any of the references of record particularly Anderson, Matoba, Johnson and Brown whether taken individually or in combination with each other.

Anderson teaches disk array in Figs. 2 and 5 thereof having a plurality of disk drives 32 each having a magnetic disk 36 for storing information, and a drive controller 34 for accessing information on the disk 36. The drive controller 34 performs array support functions to support the disk array. The drive controllers 34 in each disk drive 32 are coupled to one another so that the drive controllers 34 can communicate to perform array support functions in cooperation with one another. Fig. 5 of Anderson illustrates a build operation which is performed across an Error Correction Code (ECC) group in which a plurality of disk drives 84, 86, 88, 90, and 92 are connected to the same loop 94/96. As per col. Lines 45-51 and col. 12, lines 22 recovery of data is performed using one or more disks on the same loop 94/96.

The present invention differs from Anderson being that according to the present invention data of a disk unit connected to one communication channel of a group can be recovered using data of another disk unit connected to another communication channel of the group. As illustrated in Fig. 2 and according to the present invention as recited in the claims a group of disk which hold data that are recoverable relative to each other extend across the plural communication channels. Such features are clearly not taught or suggested by Anderson.

Anderson also fails to teach or suggest the use of a common memory for storing management data accessible by each of the disk drives and that the speed of the communication channels connecting the disk drives is faster than the disk drives as in the present invention.

Thus, Anderson fails to teach or suggest that the disk units form a plurality of groups each including at least one disk unit from each

communication channel and that the data of a disk unit connected to one communication channel of a group can be recovered using data of another disk unit connected to another communication channel of the group as recited in the claims.

Further, Anderson fails to teach or suggest a common memory which stores disk management data indicating a status of each of said disk units as recited in the claims.

Still further, Anderson fails to teach or suggest that the data transfer speed of the multiplex communication channel is higher than that of each of the disk units as recited in the claims.

The above noted deficiencies of Anderson are not supplied by Johnson. Therefore, combining the teachings of Anderson and Johnson in the manner suggested by the Examiner still fails to teach or suggest the features of the present invention as now more clearly recited in the claims.

Johnson, the same as Anderson, fails to teach or suggest that the data of a disk unit connected to one communication channel of a group can be recovered using data of another disk unit connected to another communication channel of the group, that a group of disks which hold data that are recoverable relative to each other extend across the plural communication channels, that a common memory is provided for storing management data accessible by each of the disk drives and that the speed of the communication channels connecting the disk drives is faster than the disk drives as in the present invention.

Thus, Johnson fails to teach or suggest that the disk units form a plurality of groups each including at least one disk unit from each

communication channel and that the data of a disk unit connected to one communication channel of a group can be recovered using data of another disk unit connected to another communication channel of the group as recited in the claims.

Further, Johnson fails to teach or suggest a common memory which stores disk management data indicating a status of each of said disk units as recited in the claims.

Still further, Johnson fails to teach or suggest that the data transfer speed of the multiplex communication channel is higher than that of each of the disk units as recited in the claims.

Therefore, combining Anderson and Johnson in the manner suggested by the Examiner does not render obvious the features of the present invention as now more clearly recited in the claims. Accordingly, reconsideration and withdrawal of the 35 USC §103(a) rejection of claims 13, 14, 18-20 and 24 as being unpatentable over Anderson in view of Johnson is respectfully requested.

The above noted deficiencies of Anderson and Johnson are not supplied by Matoba and Brown. Therefore, combining the teachings of Anderson and Johnson with one or more of Matoba and Brown in the manner suggested by the Examiner still fails to teach or suggest the features of the present invention as now more clearly recited in the claims. Although Matoba is relied on for an alleged teaching of a common memory and Brown is relied on for an alleged teaching of ECC groups across different communication channels neither of these references teach or suggest that the data of a disk unit connected to one communication channel of a group can be recovered

using data of another disk unit connected to another communication channel of the group and that the speed of the communication channels connecting the disk drives is faster than the disk drives as in the present invention.

Thus, both Matoba and Brown fail to teach or suggest that the disk units form a plurality of groups each including at least one disk unit from each communication channel and that the data of a disk unit connected to one communication channel of a group can be recovered using data of another disk unit connected to another communication channel of the group as recited in the claims.

Further, both Matoba and Brown fail to teach or suggest a common memory which stores disk management data indicating a status of each of said disk units as recited in the claims.

Still further, both Matoba and Brown fail to teach or suggest that the data transfer speed of the multiplex communication channel is higher than that of each of the disk units as recited in the claims.

Therefore, combining Anderson, Johnson, Matoba and Brown in the manner suggested by the Examiner does not render obvious the features of the present invention as now more clearly recited in the claims. Accordingly, reconsideration and withdrawal of the 35 USC §103(a) rejections of claims 1-12, 15-17 and 21-13 as being unpatentable over Anderson in view of Johnson, Matoba and Brown is respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references utilized in the rejection of claims 1-24.

In view of the foregoing amendments and remarks, applicants submit that claims 1-24 are in condition for allowance. Accordingly, early allowance of claims 1-24 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (500.37509CX2).

Respectfully submitted,

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